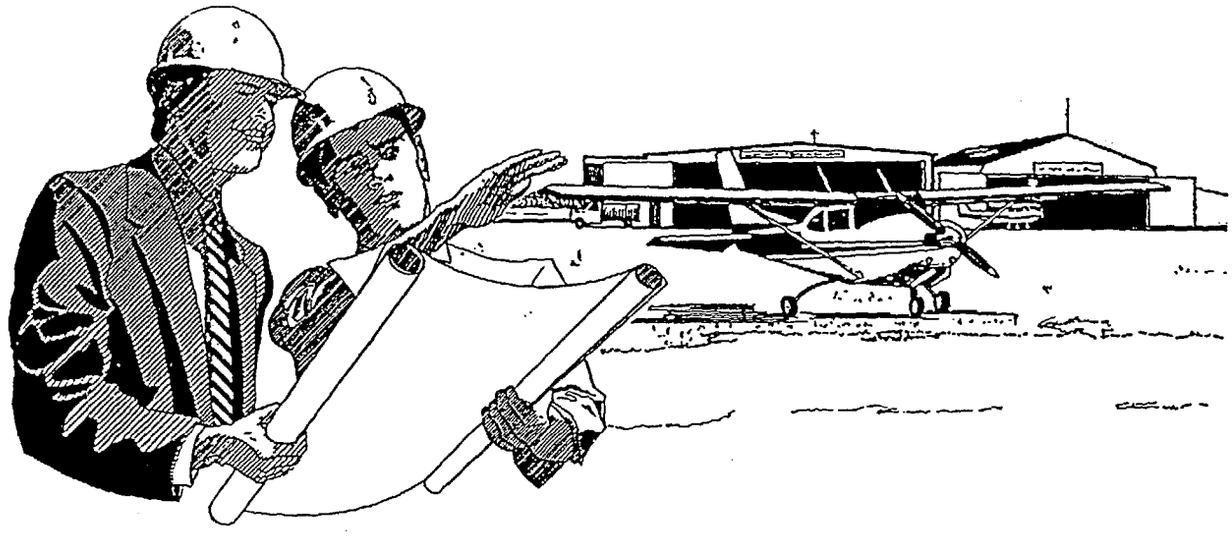
Chapter Four
DEVELOPMENT ALTERNATIVES



Chapter Four
DEVELOPMENT ALTERNATIVES

The next step in the master planning process is the identification and evaluation of development alternatives. It may be the most important step since the decisions made concerning the future development of airport facilities will influence management of the airport's assets throughout the planning period. In evaluating the various ways facilities can be constructed, there are countless combinations and alternatives that must be reviewed. The influence of cost, terrain, utilities, land ownership, existing facilities and a myriad of other factors requires the planner to use intuitive judgment in identifying those alternatives which provide the greatest potential for implementation.

The development alternatives for Mesa-Falcon Field can be categorized into two functional areas: the **airside** (airfield) and the **landside** (general aviation hangars, apron and facilities) area. Within each of these areas, specific facilities are required or desired. Although each functional area is treated separately, planning must integrate the individual requirements so that they complement one another. There will be limitations imposed on the potential construction of these facilities by the factors mentioned above (terrain, cost, utilities, social impact, etc.), as well as by the sponsors of the airport. These limitations might be significant or cause insurmountable problems.

The total impact of all of these factors on the existing airport must be evaluated to determine if the investment in Mesa-Falcon Field will meet the needs of the citizens of the community during and beyond the planning period. But before beginning this process, consideration must also be given to a "do nothing" or "no build" alternative as well as the possibility of transferring demand to another airport altogether. These alternatives are addressed in the narrative that follows.

DO NOTHING ALTERNATIVE

In analyzing and comparing costs and benefits of various development alternatives, it is important to consider the consequences of no future development at Mesa-Falcon Field Airport. This "do nothing" alternative essentially considers keeping the airport in its present condition and not doing any improvements to the existing facilities. The primary result of this alternative, as in any growing air transportation market, would be the eventual inability of the airport to satisfy the increasing demands of the airport service area.

The Facility Requirements chapter identified a need for airfield improvements to increase the capability, efficiency and safety of the airport. These needs: a longer runway length, additional hangars, additional apron, corporate parcels, commercial/industrial areas, etc, should be evaluated based upon the existing airport assets and potential for expansion. Without improvements and expansion, the airport will have a limited capability to accommodate corporate aircraft or meet the demands of the general aviation community. The airport will be unable to improve its revenue production or contribute to the commercial/industrial development of the community. Expanded facilities will become necessary if the airport is to grow and prosper. To ignore these needs will restrict the growth of all facets of aviation in the Mesa area. This will, in turn, reflect on commerce and economic growth in the region.

Without expansion and growth in the numbers of based aircraft at Mesa-Falcon Field Airport, there will be a significant economic impact on existing businesses. General aviation businesses might not be able to sustain the same level of service without additional development of the airport. Without expansion potential, general aviation related businesses would be somewhat restricted and limited in terms of their own growth. With a limit on growth, the ability of the airport to attract new business would be adversely affected.

The City, State and Federal investment in the airport may not be realized should the airport operational activity decline. The investment in hangars and buildings by private owners and the City must also be considered in any decision to "do nothing". The impact on the Mesa area could be adverse, and would be expected to contribute to job loss and other negative economic impacts.

The "do-nothing" alternative could result in a general deterioration of facilities, reduction in service and pose a serious threat to safe airport and aviation operations. The "do nothing" alternative is inconsistent with the long term goals of the City of Mesa, the Maricopa Association of Government's Regional Airport System Plan and the FAA. It would affect the long term viability of the airport and the airport's service area. This alternative is not considered feasible nor prudent.

TRANSFERRING DEMAND TO ANOTHER AIRPORT

The alternative of providing aviation services through other existing airports in the region might be possible but not without significant impact on the airport(s). There are at least three airports in the region that are capable of meeting the Mesa area demand, however, it could not be accomplished without substantial alteration and expansion of terminal area facilities as well as the supporting infrastructure at these airports.

Deer Valley, Scottsdale and Chandler Airports offer general aviation services and facilities commensurate with Mesa-Falcon Field. Assuming transfer of demand was accepted, the increase in based aircraft forecast for Falcon Field would not be accommodated and these other airports will probably see an increase in demand for

services and facilities that could be a major impact on any of the airports. There might be a potential for as many as 200 or more based aircraft owners seeking facilities for their planes. It is probable these aviation facility impacts would be spread among the airports but in either case, a significant impact will be created in the process.

WILLIAMS AIR FORCE BASE CLOSURE

Another option would be to transfer service to Williams Air Force Base (AFB) when the base terminates military operations and becomes available for civilian use. Certainly, Williams AFB, located within the Mesa City limits, would be a logical candidate for examining the alternative of providing general aviation services at another airport. However, at the present time, there are several political and economic decisions to be made concerning the use of Williams AFB.

Williams AFB is on property deeded to the U.S. Government by the City of Mesa for use as a military training base. The Defense Department (DOD) is responsible, through a long complicated process, for disposing of the property. This will involve coordination with other government agencies, the State and the City, to determine if there is any interest in obtaining rights to the property and facilities.

In brief, military departments, DOD agencies, and nonappropriated fund instrumentalities have the first opportunity to buy the property. If there is no demand for the base from these sources, the Department of Housing and Urban Development (HUD) is offered an opportunity to purchase the property (estimated military value is $122.1 million for the 4,694 acres). If HUD has no requirement for the property then other federal agencies are screened to determine if there is any interest. If no federal requirement exists for the property, the Defense Department screens the property with State and local (Mesa) officials to determine if there is any interest. Special circumstances may warrrant consideration of other alternatives. If there is no State or local interest, then the Defense Department will dispose of the property through sealed bids or auction.

Although the process appears long and complicated, an interest in the property by the State or City may circumvent the procedural process. The Governor has appointed a Williams AFB Economic Re-use Advisory Board that will make recommendations to the Governor for William's fate by July 1992. The Defense Department and Congress will still have to approve such a transaction. Some of the uses presently under consideration include an airport, a third campus for Arizona State University, a minimum security. prison, an aircraft manufacturing plant for McDonnell Douglas Corporation and as a research facility.

In summary, the availability of Williams AFB for consideration as an alternative to the existing airfield will not occur in the short term. If the City should acquire the property (and this is not at all certain), the use of the airport facilities for general aviation is still uncertain.

Since transferring demand to other airports does not appear to be a prudent or feasible option, the remainder of the chapter will focus on the development alternatives for the existing facility. The ultimate objective will be to develop a balanced airside and landside complex to serve all segments of forecast aviation demand.

AIRPORT DEVELOPMENT ALTERNATIVES

The previous chapter identified both the airside and the landside facilities necessary to meet the forecast demand throughout the planning period. The purpose of the remainder of this chapter is to develop

alternatives that meet the needs of the airport, evaluate the alternatives and then select one or a combination of alternatives, for future development.

In order to achieve a balance in the development of the airport, each alternative will examine the airside development (runways, taxiways, etc.,) in conjunction with a recommended location for the landside facilities (hangars, buildings, taxilanes, etc.). The major development objectives within each area will be examined in the paragraphs to follow.

Runway Extension: Examine the length of the primary runway and determine the proper length of the parallel runway in order to accommodate the aircraft forecast to use the airport. Examine runway lengths up to and including 8,300 feet. In evaluating the amount of runway length that should be provided, an assumption was made that a business jet aircraft should be able to reach a 1,500 nautical mile (nm) destination, at the airport's elevation and a temperature condition of 86 degrees fahrenheit.

Evaluate the potential for increasing capability: To determine if the proposed airfield configuration is able to accommodate Approach Category C (aircraft approach speeds between 121-141 knots) and/or improve the efficiency of operation with respect to the functional areas on the airport.

General Aviation: Locate the general aviation facilities to take advantage of the available airport property. Assess the ability of the parallel runways to support two separate general aviation areas. Examine taxiway/taxilane access to airport property south of Falcon Drive.

Falcon Drive-Taxiway B6/B7 Alternatives: Evaluate alternative road-taxiway alignments in order to prevent accidental vehicle/aircraft incidents.

ALTERNATIVE EVALUATION CRITERIA

The analysis will evaluate each alternative based on the following factors:

- **Land Acquisition:** The amount of additional property that will have to be acquired in order to accommodate any airside or landside alternative.

- **Airport Capacity:** The runway configuration's potential to increase airport capacity.

- **Compatibility:** The impact land acquisition and aircraft noise levels will have on existing and future land use. (The impacts of helicopter operations at the McDonnell Douglas Helicopter Company are expected to remain essentially the same throughout the period, therefore, only the noise impacts resulting from the alternative runway configurations will be examined and compared.)

- **Ground Access:** Examine the ground transportation and pilot/passenger access to each of the general aviation areas. Include any costs to improve accessibility in the cost of constructing the alternative.

- **Cost:** The cost of developing the alternative runway configuration at the airport.

- **Operational Efficiency:** Examine the capacity of the runway configuration to serve the general aviation, and terminal areas. Examine the ability of the taxiway/taxilane system to serve general aviation uses.

- **Airspace Compatibility:** The degree to which the runway configuration and/or approaches affect airspace complexity.

This chapter will discuss the potential development alternatives, describing the salient characteristics of each alternative and the advantages and disadvantages of each. Recommendations will be reviewed with the Planning Advisory Committee as well as the airport staff in order to resolve the issues and determine a development program for the future of Mesa-Falcon Field Airport.

AIRSIDE DEVELOPMENT ALTERNATIVE 1

In **Alternative 1**, illustrated on **Exhibit 4A**, the existing runway configuration is unchanged. A nonprecision instrument approach has been planned to both runways. The approach slopes for both runways would be 34 to 1. A displaced threshold of approximately 145 feet will be required with a nonprecision approach to Runway 22L, however, no displacement will be required for Runway 4R. The runway protection zones (RPZ) will increase in size and require additional avigation easements or land acquisition for Runway 4R (.22 acres) and 22L (14.3 acres).

Operational Aspects

The operational aspects of this runway configuration are important to the evaluation process. Alternative 1 cannot accommodate Approach Category C aircraft due to a lack of sufficient airport property at the ends of the runway(s) to meet the FAA standard runway safety area requirement (1,000 feet beyond the end of the runway). In order to meet the requirements for an Approach Category C aircraft, the usable runway length would need to be reduced. This would be an impractical solution at this airport since obtaining additional runway length for takeoff is one of the major objectives in this analysis. There also would be no increase in airfield capacity with this alternative runway configuration.

This runway alternative would limit the fleet of business jet aircraft that could operate at the airport by approximately 30 percent, assuming a 1,500 nautical mile (nm) destination.

Environmental Aspects

Exhibit 4B depicts the projected 65 Ldn noise contour for this alternative based upon the operational level and aircraft mix that is anticipated to occur at the airport by the end of the planning period (2015). The 65 Ldn noise contour was selected for evaluation because it is the noise contour that FAA and other federal agencies, EPA and HUD, recognize as the noise level where residential land uses are not compatible.

The 65 Ldn noise contour will increase in size and by the year 2015 impact approximately 238 acres of property, compared with the existing impact of 150 acres of property. These noise impacts will remain almost entirely on the airport with the exception of approximately 14 acres of off-airport noise impact northeast of Runway 22L. These noise impacts are on industrial land uses or within the existing RPZ for Runway 22L.

The Airport traffic patterns will continue to be flown north of Runway 4R-22L and there should be no significant changes to existing flight operations.

Advantages and Disadvantages

The advantages to this alternative are the low cost, low environmental impact and ease of implementation. Nonprecision instrument approaches on both runway ends will reduce the runway length for landings on Runway 22L to 4,955 feet, however, landings on 4R will have the existing runway length.

One disadvantage of Alternative 1 is that the lack of additional runway length for takeoff could limit the jet aircraft use of the airport during the high temperature periods. The existing runway length will limit the range

and/or payload capacity of some business jet aircraft.

From an environmental standpoint, the future noise patterns resulting from this runway alternative will approximate the existing noise footprint, although affecting a larger area.

AIRSIDE DEVELOPMENT ALTERNATIVE 2

Airside Alternative 2, as illustrated on **Exhibit 4C**, depicts runway extensions to both ends of Runway 4R-22L. These runway extensions will allow Approach Category B runway safety areas (300 feet beyond each runway end). With construction of this alternative, 6,000 feet of runway length will be available for takeoff.

FAA design criteria stipulates that an obstacle free area (OFA) 500 foot wide by 600 feet in length must be available at the end of the runway. In the past, FAA has waived this requirement for older airports, as long as the runway safety area requirement is met. In this alternative, as well as the ones to follow, an assumption has been made that the OFA will be an acceptable deviation from standard. FAA Part 77 will govern all runway end displacements for the alternatives discussed in this chapter.

A nonprecision instrument approach to Runway 22L will require a displaced runway threshold of 660 feet to accommodate the Part 77 obstruction clearance requirement over a public road. The same Part 77 requirement on Runway 4R will require a 395 foot displaced threshold. The landing runway lengths will be 5,605 feet for Runway 4R and 5,340 feet for Runway 22L.

The Runway 4R-22L RPZ's will increase in size for the nonprecision approaches and will require an increase in the amount of avigation easements or land to be acquired (approximately 15 acres), similar to Alternative 1.

Operational Aspects

The operational aspects of this runway configuration are similar to Alternative 1. This runway configuration cannot accommodate Approach Category C aircraft without reduction in the size of the usable runway to accommodate the FAA standard runway safety area (1,000 feet required from the end of the runway). Construction of this alternative would not produce an increase in airfield capacity.

This runway alternative, with a 6,000 foot runway length for takeoff, would allow more business jet aircraft to operate at the airport. In comparison with the length of runway available for takeoff in Alternative 1, Alternative 2 would permit 96 percent of the business jets to operate at Falcon Field (assuming a 1,500 nm destination).

Environmental Aspects

Exhibit 4D depicts the projected 65 Ldn noise contour for this alternative based upon the operational level and aircraft mix that is anticipated to occur at the airport by the end of the planning period. The 65 Ldn noise contour will impact approximately 414 acres of property.

Although most of the impacts resulting from Alternative 2 are contained on airport property, some of these impacts are on property outside of the airport boundaries. The 65 Ldn noise levels will impact approximately 108 acres of off-airport property, 75 acres of property to the northeast (with most of these noise impacts occurring within the RPZ) and approximately 19 acres of noise impact to the southwest. Approximately 7 acres of agricultural land use (which is planned for future residential) and 12 acres in outdoor recreation use (Gene Autry Park) constitute the off-airport 65 Ldn noise impacts to the southwest of the airport. The off-airport noise level impacts to the northeast are predominantly on land in industrial land use, under avigation easement

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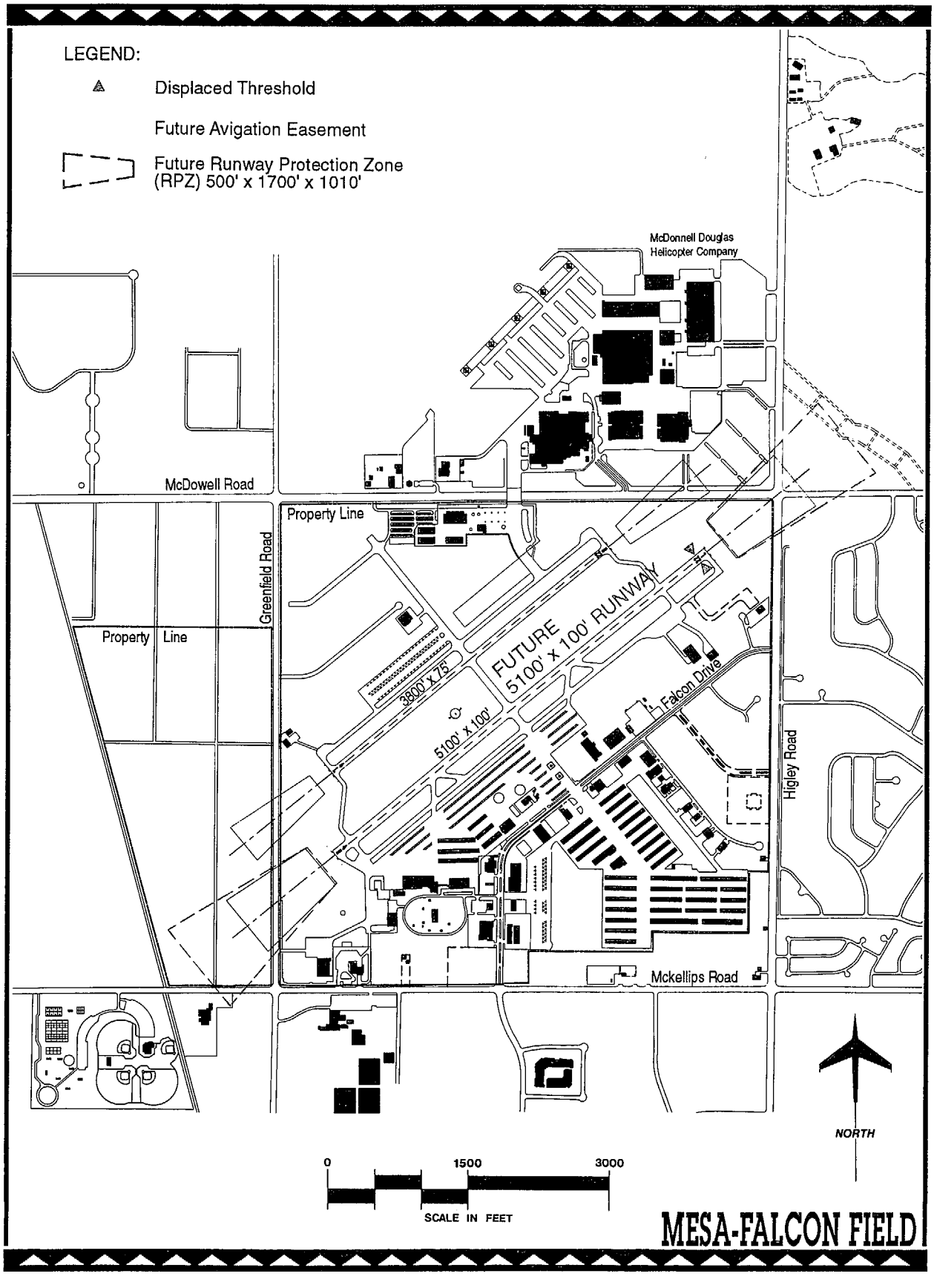

Exhibit 4A
AIRSIDE DEVELOPMENT - ALTERNATIVE 1

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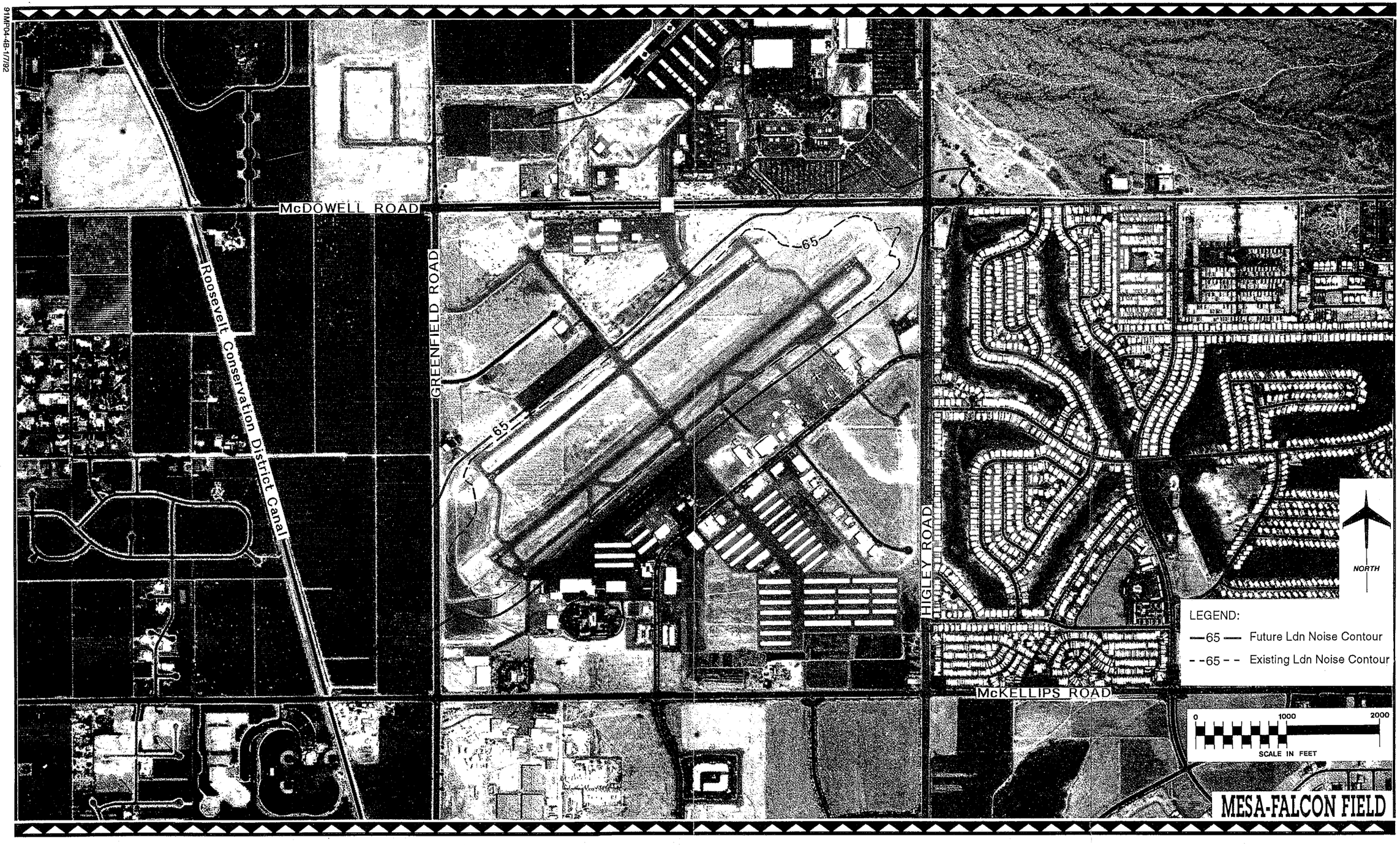

Exhibit 4B
ALTERNATIVE 1 - YEAR 2015 NOISE CONTOUR

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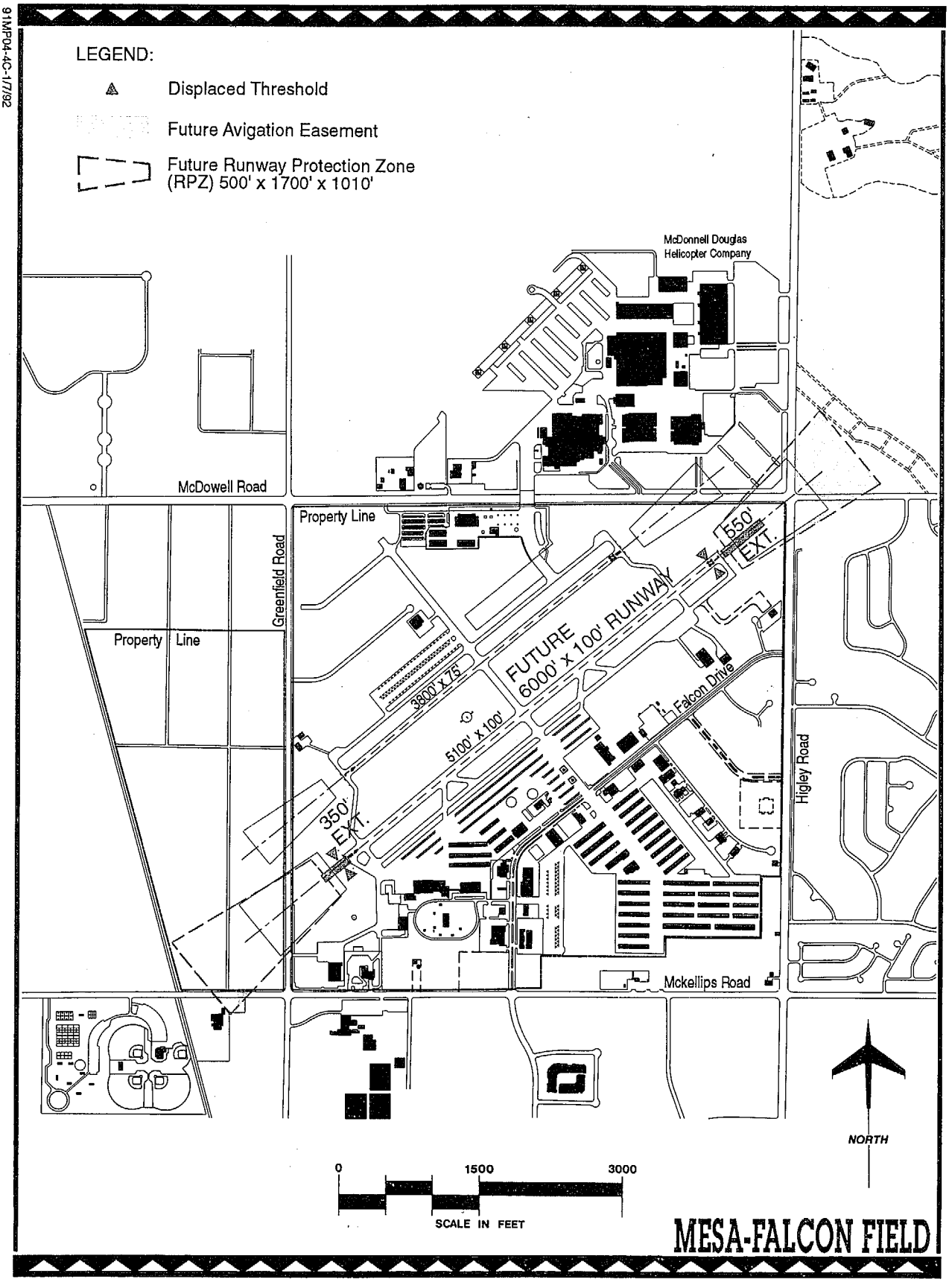

Exhibit 4C
AIRSIDE DEVELOPMENT - ALTERNATIVE 2

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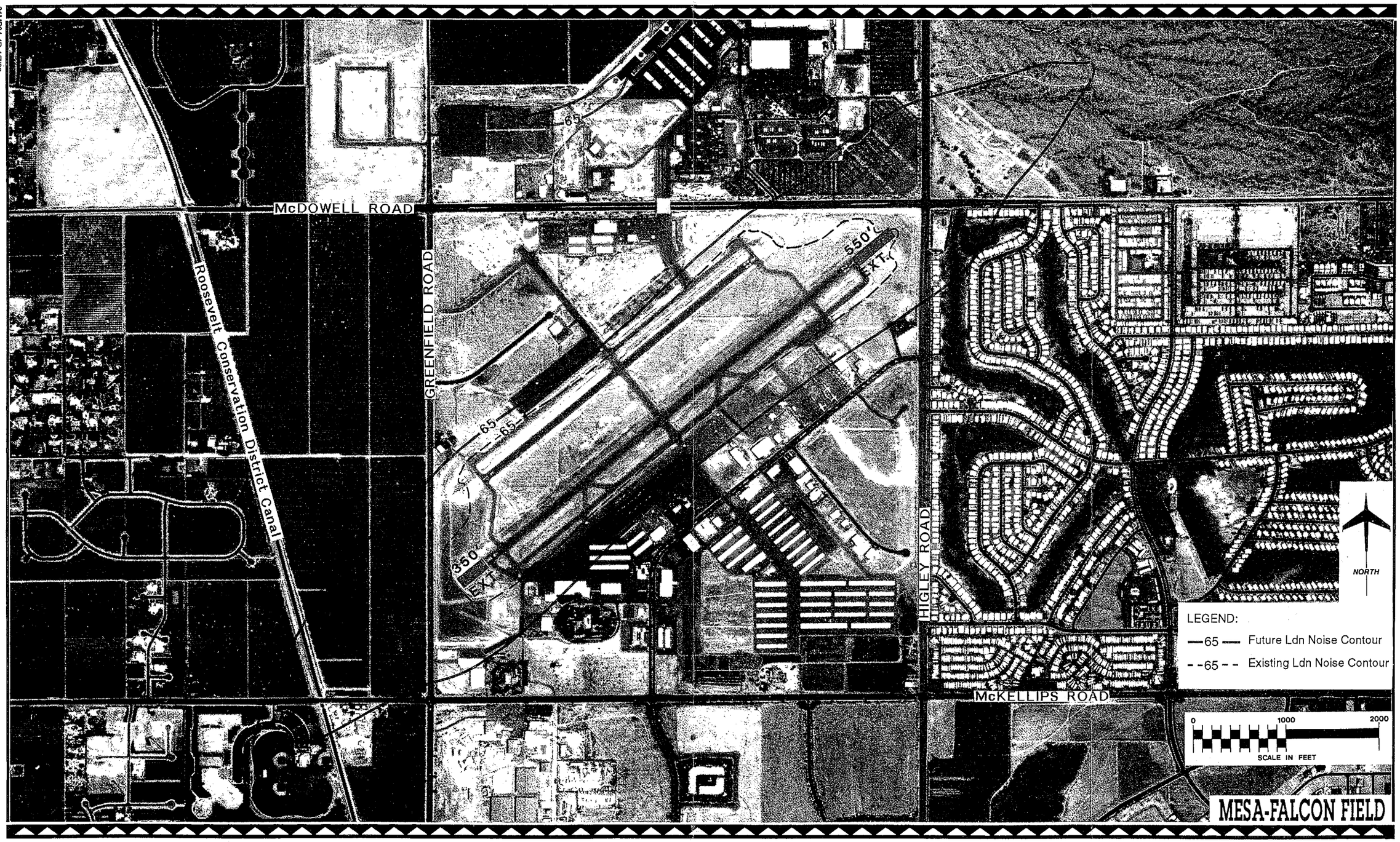

Exhibit 4D
ALTERNATIVE 2 - YEAR 2015 NOISE CONTOUR

or planned commercial land use. However, approximately 11 acres of property is in residential land use (the northwest section of the Apache Wells subdivision).

The Airport traffic patterns will continue to be flown north of Runway 4R-22L and there should be no significant changes to existing flight operations.

Advantages and Disadvantages

The advantages to this alternative are the modest cost, limited environmental impact and ease of implementation. This alternative reduces significantly, the limitations imposed by temperature and density altitude on jet aircraft operating at the airport.

One disadvantage of Alternative 2 is the 6,000 foot runway length might still limit the range and/or payload capacity of a few business jet aircraft.

From an environmental standpoint, the future noise patterns resulting from this runway alternative will affect a slightly larger area than Alternative 1. Property acquisition or avigation easement requirements for the increase in RPZ size for nonprecision instrument approaches are approximately the same as Alternative 1.

AIRSIDE DEVELOPMENT ALTERNATIVE 3

With Airside Alternative 3, as illustrated on Exhibit 4E, Runway 4R-22L is increased in length to 7,450 feet by extending Runway 4R a distance of 1,800 feet and Runway 22L a distance of 550 feet. The nonprecision approaches for both runways are similar to Alternatives 1 and 2. A displaced runway threshold of approximately 695 feet will be required for Runway 22L. A displaced threshold of 300 feet will be required to accommodate the nonprecision approach to Runway 4R. Additional avigation easements or land acquisition (approximately 37 acres) will be required for the increase in size of the RPZ's.

The extension to Runway 4R will be constructed entirely on airport property, however, a major realignment of Greenfield Road will be required. Approximately 15 additional acres of property will be required for the Runway 22L RPZ.

Operational Aspects

It would be possible to accommodate Approach Category C aircraft (aircraft with approach speeds between 121 and 140 nautical miles per hour), however the runway length for takeoff would require 1,000 foot runway safety areas and effectively reduce the runway available for takeoff from 7,450 feet to 6,570 feet on Runway 22L and 6,550 feet on Runway 4R. Although the airport's capacity would not increase with this runway construction, the airport's ability to attract larger business jet aircraft would be enhanced.

This runway alternative could accommodate nearly 100 percent of the business jet aircraft and improve the range and capability of business jet aircraft during high temperature and high density altitude conditions.

Environmental Aspects

Exhibit 4F depicts the projected 65 Ldn noise contour for this alternative based upon the operational level and aircraft mix that is anticipated to occur at the airport by the end of the planning period (2015). The 65 Ldn noise contour will increase in size and by the year 2015, impact approximately 448 acres of property. Although most of these impacts are contained on airport property, some of these noise level impacts (83 acres) are on property outside of the airport boundaries.

The 65 Ldn noise level will impact approximately 60 acres of off-airport property to the northeast. A majority of these impacts are on land in industrial land use or vacant and planned for industrial land use.

However, approximately 11 acres of residential land use in the northwest section of the Apache wells subdivision is also within the 65 Ldn noise contour.

To the southwest, the 65 Ldn noise contour affects approximately 48 acres off-airport. Most of this impact is in agricultural land use, however, approximately 8 acres is planned for residential land use in the future. Approximately 20 acres of impact is on the outdoor recreation area, Gene Autry Park.

The Airport traffic patterns will continue to be flown north of Runway 4R-22L and there should be no significant changes to existing flight operations.

Advantages and Disadvantages

The primary advantage of this alternative is the increase in the capability of airport to accommodate all types of business jet aircraft under most weather conditions. The disadvantages are primarily cost and environmental impact. Nonprecision instrument approaches on both runway ends will reduce the runway length for landings on Runway 22R to 6,755 feet while the landing runway length on Runway 4R will be 7,150 feet. In both cases, the landing runway length will be adequate.

From an environmental standpoint, the future noise patterns resulting from this runway alternative will approximate the existing noise footprint, although affecting a larger area. In comparison with the other alternatives examined, the noise levels in off-airport impacted areas will increase.

AIRSIDE DEVELOPMENT ALTERNATIVE 4

With **Airside Alternative 4**, as illustrated on Exhibit 4G, Runway 4R-22L is increased in length to 8,300 feet by extending Runway 4R a distance of 350 feet and Runway 22L a distance of 2,800 feet. Nonprecision approaches are planned for both runways, similar to the previous alternatives. A 150-foot displaced runway threshold will be required to accommodate the Part 77 clearance requirement over a public road. If this alternative is recommended, McDowell Road will be diverted and an underpass constructed for Higley Road.

In this alternative approximately 55 acres will need to be acquired to construct the extension to Runway 22L. An additional 45 acres of property will require acquisition or avigation easements to protect the nonprecision instrument approach RPZ's for both runway ends.

Operational Aspects

It would be possible to accommodate Approach Category C aircraft (aircraft with approach speeds between 121 and 140 nautical miles per hour), however the runway length for takeoff would require a runway safety area length of 1,000 feet and effectively reduce the runway available for takeoff from 8,300 feet to 7,400 feet on Runway 22L. Although the airport's capacity would not increase with this runway construction, the airport's ability to attract larger business jet aircraft would be enhanced.

This runway alternative could accommodate approximately 100 percent of the business jet aircraft and improve the range capability of business jet aircraft during high temperature and high density altitude conditions.

Environmental Aspects

There are at least three environmental impacts anticipated from this alternative: construction impacts, noise impacts and land acquisition.

The major environmental impacts will result from the proposed realignment/restructuring of Higley and McDowell Roads and the impact on the residential and industrial land

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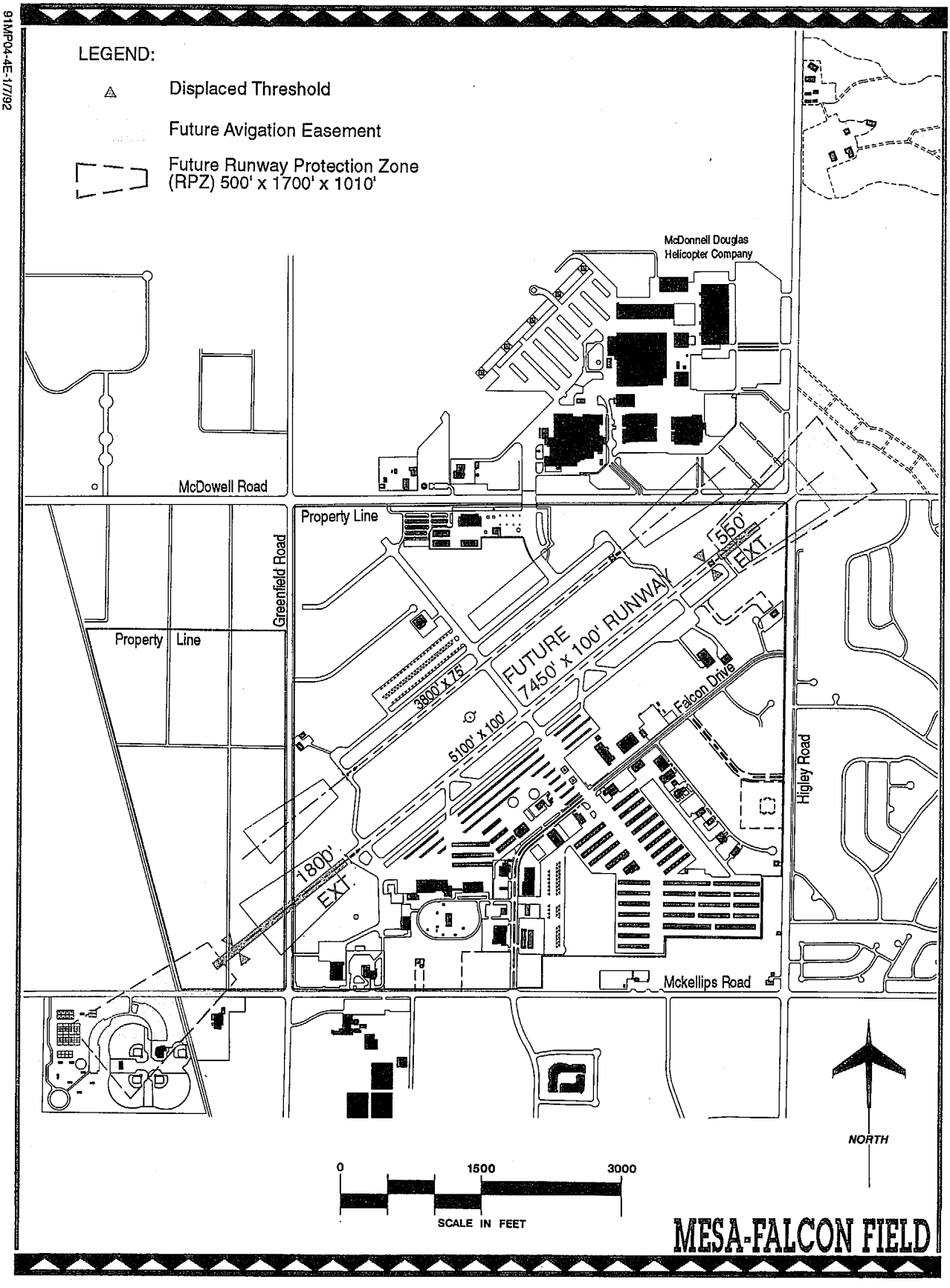

Exhibit 4E
AIRSIDE DEVELOPMENT - ALTERNATIVE 3

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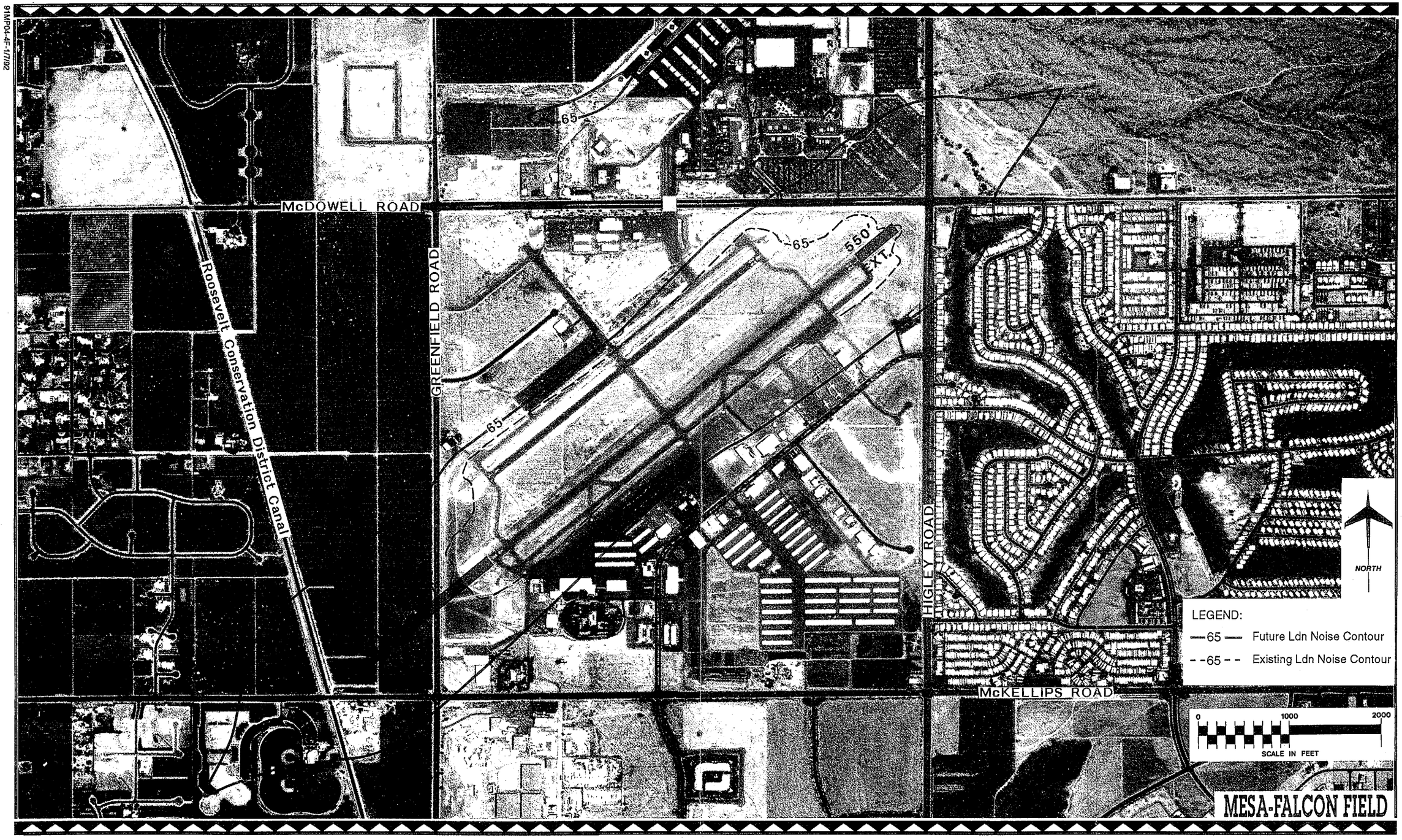

Exhibit 4F
ALTERNATIVE 3 - YEAR 2015 NOISE CONTOUR

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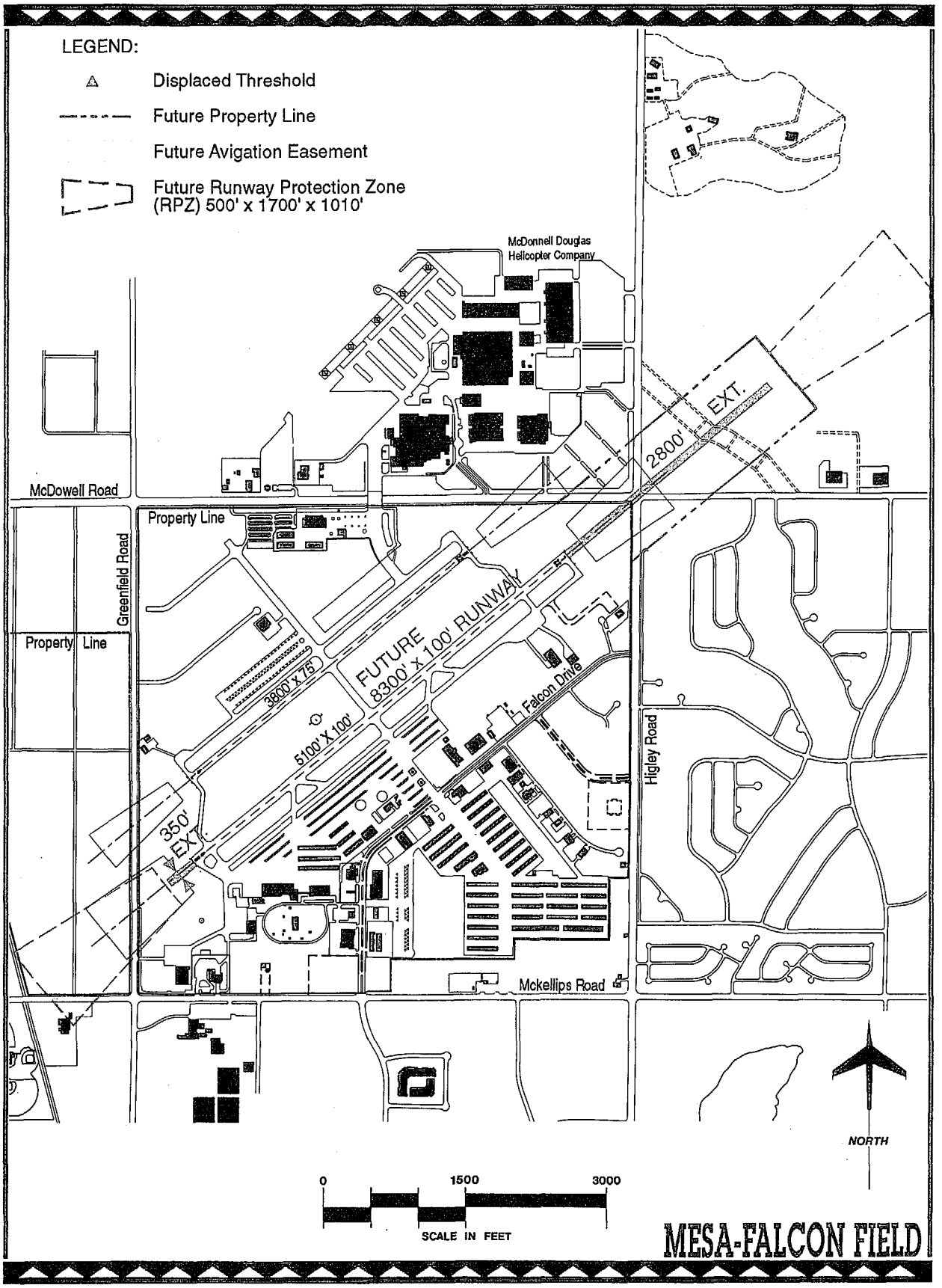

Exhibit 4G
AIRSIDE DEVELOPMENT - ALTERNATIVE 4

uses in the area as well as the transportation plans for the City of Mesa.

Exhibit 4H depicts the projected 65 Ldn noise contour for this alternative based upon the operational level and aircraft mix that is anticipated to occur at the airport by the end of the planning period (2015). The 65 Ldn noise contour will increase in size and by the year 2015, impact approximately 574 acres of property (compared with the existing noise level impact on 150 acres of property). Although this is the largest area affected by noise of any of the alternatives, approximately 90 percent of the impact will be on airport property (or property to be acquired in order to construct the alternative).

Assuming the proper amount of land is acquired to construct the runway extension to the northeast, the 65 Ldn noise contour will impact approximately 11 acres of industrial land use north of Runway 22L and 9 acres of residential land use south of Runway 22L.

The Airport traffic patterns will continue to be flown north of Runway 4R-22L and there should be no significant changes to existing flight operations.

Approximately 67 acres of property will be required for the runway extension and approximately 30 acres of property (either purchased or under easement) for the nonprecision instrument approach RPZ's to both runway ends.

Advantages and Disadvantages

The primary advantage of this alternative is the increase in the capability of airport to accommodate all types of business jet aircraft under most weather conditions. Another advantage is the resulting noise impacts will be predominantly contained within airport property.

The disadvantages are the difficult and expensive cost of restructuring the Higley-McDowell intersection and environmental impact. From an environmental standpoint, the future noise patterns resulting from this runway alternative will approximate the existing noise footprint, although affecting a larger area. In comparison with the other alternatives examined, the noise levels in off-airport impacted areas will be reduced and the major impacts will occur on vacant land or land planned for industrial use.

AIRSIDE DEVELOPMENT ALTERNATIVE 5

With Airside Alternative 5, as illustrated on Exhibit 4I, Runway 4R-22L is increased in length to 8,300 feet by extending Runway 4R a distance of 1,800 feet and Runway 22L a distance of 1,400 feet. Nonprecision approaches are planned for both runways, similar to the previous alternatives. A 300 foot displaced threshold will be required to accommodate the nonprecision approach to Runway 4R. If this alternative is recommended, McDowell-Higley Road restructuring will be accomplished similar to Alternative 4 and the Greenfield realignment will be similar to Alternative 3.
In this alternative approximately 30 acres will need to be acquired to construct the extension to Runway 22L. Land acquisition or avigation easements for an additional 53 acres of property will be required to protect the RPZ's for both runway ends.

Operational Aspects

It would be possible to accommodate Approach Category C aircraft (aircraft with approach speeds between 121 and 140 nautical miles per hour), however the runway length for takeoff would require a runway safety area length of 1,000 feet and effectively reduce the runway available for takeoff from 8,300 feet to 7,400 feet on Runway 22L. Although the airport's capacity would not increase with this runway construction, the airport's ability to attract larger business jet aircraft would be enhanced.

This runway alternative could accommodate approximately 100 percent of the business jet aircraft and improve the range capability of business jet aircraft during high temperature and high density altitude conditions.

Environmental Aspects

The environmental impacts will be similar to those described for Alternative 4, however, the construction impacts will be greater because two road networks are affected.

Exhibit 4J depicts the projected 65 Ldn noise contour for this alternative. The 65 Ldn noise contour will increase in size and by the year 2015, impact approximately 452 acres of property (compared with the existing noise level impact on 150 acres of property).

The majority of the environmental impacts result from the realignment/restructuring of Higley, McDowell and Greenfield Roads and the resulting impact on the residential/industrial land uses in these areas and the transportation plans of the City.

Assuming the proper amount of land is acquired to construct the runway extension to the northeast, the 65 Ldn noise contours will impact approximately the same area and land uses as in Alternative 4 (20 acres within the 65 Ldn).

The Airport traffic patterns will continue to be flown north of Runway 4R-22L and there should be no significant changes to existing flight operations.

This alternative will require the acquisition of approximately 28 acres of land for construction and avigation easements or purchase of 30 acres for the Runway 22L RPZ.

Advantages and Disadvantages

The primary advantage of this alternative is the increase in the capability of the airport to accommodate all types of business jet aircraft under most weather conditions. Another advantage is that the resulting noise impacts will be predominantly contained within airport property.

The disadvantages are the difficult and expensive cost of restructuring the Greenfield-McKellips and Higley-McDowell intersections and subsequent environmental impact. From an environmental standpoint, the future noise patterns resulting from this runway alternative will approximate the existing noise footprint, although affecting a larger area. In comparison with Alternative 3, the noise level impact to the southwest is reduced while noise impacts to the northeast remain essentially unchanged.

RUNWAY LENGTH EVALUATION

The FAA recommends that the runway length for an airport be computed at the mean daily maximum temperature of the hottest month in order to plan for the worst case at the airport. But this recommendation also assumes there are no factors such as terrain limitations, obstacles, environmental impacts, etc. In an attempt to evaluate the appropriate runway length for Mesa Falcon-Field, the optimum length (8,300 feet) was weighed against some of these factors in an attempt to determine the most reasonable runway length for the existing airport condition. The last factor, the ability to accommodate corporate business jet aircraft, is also evaluated in this section.

An analysis was conducted to determine what affect different runway lengths would have on the performance capability of business jet aircraft. Specifically, the performance charts for various business jet aircraft were studied to determine what runway length(s) would accommodate the most business jet aircraft. Not all business jet aircraft were evaluated, only those that were considered likely to use Falcon Field.

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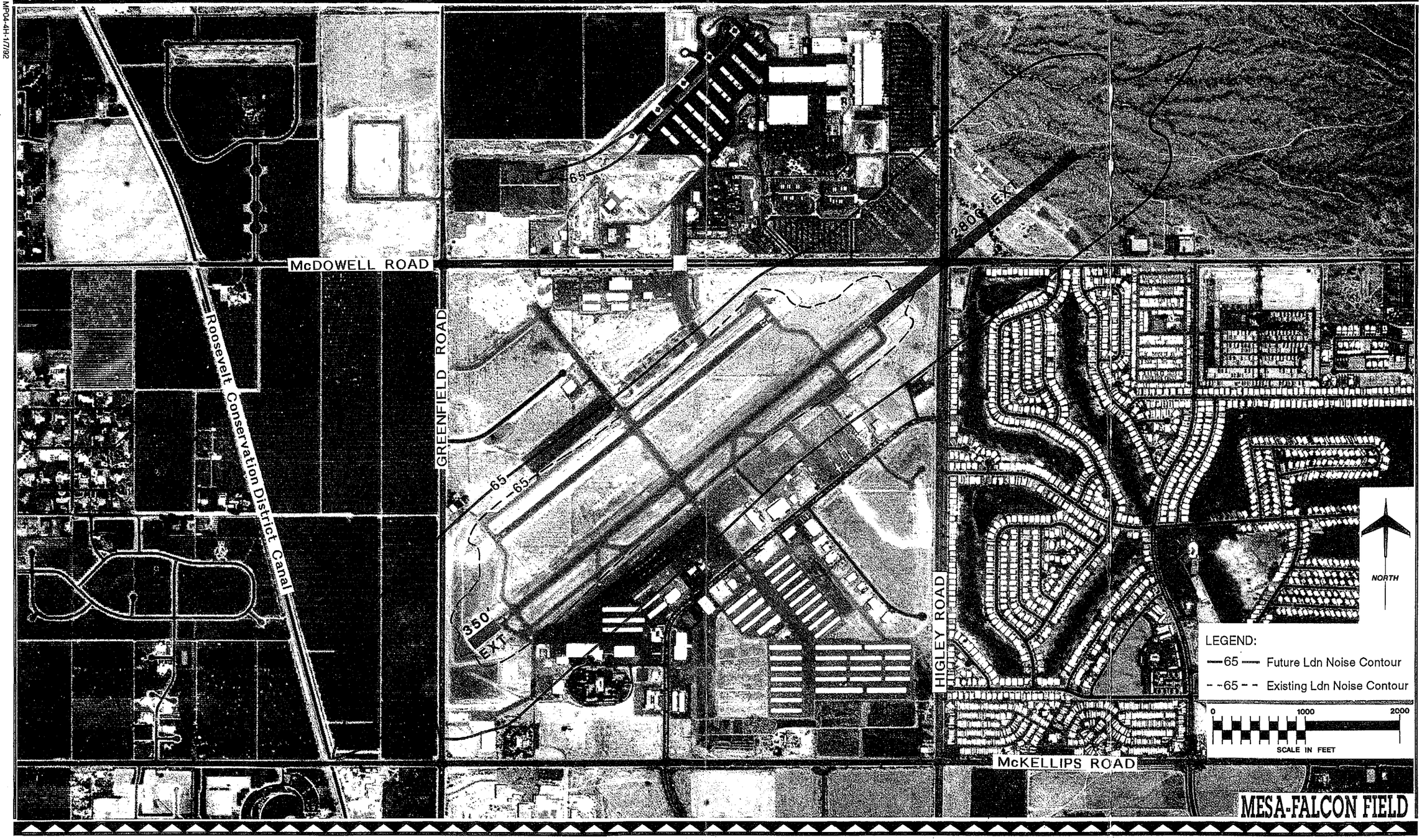

Exhibit 4H
ALTERNATIVE 4 - YEAR 2015 NOISE CONTOUR

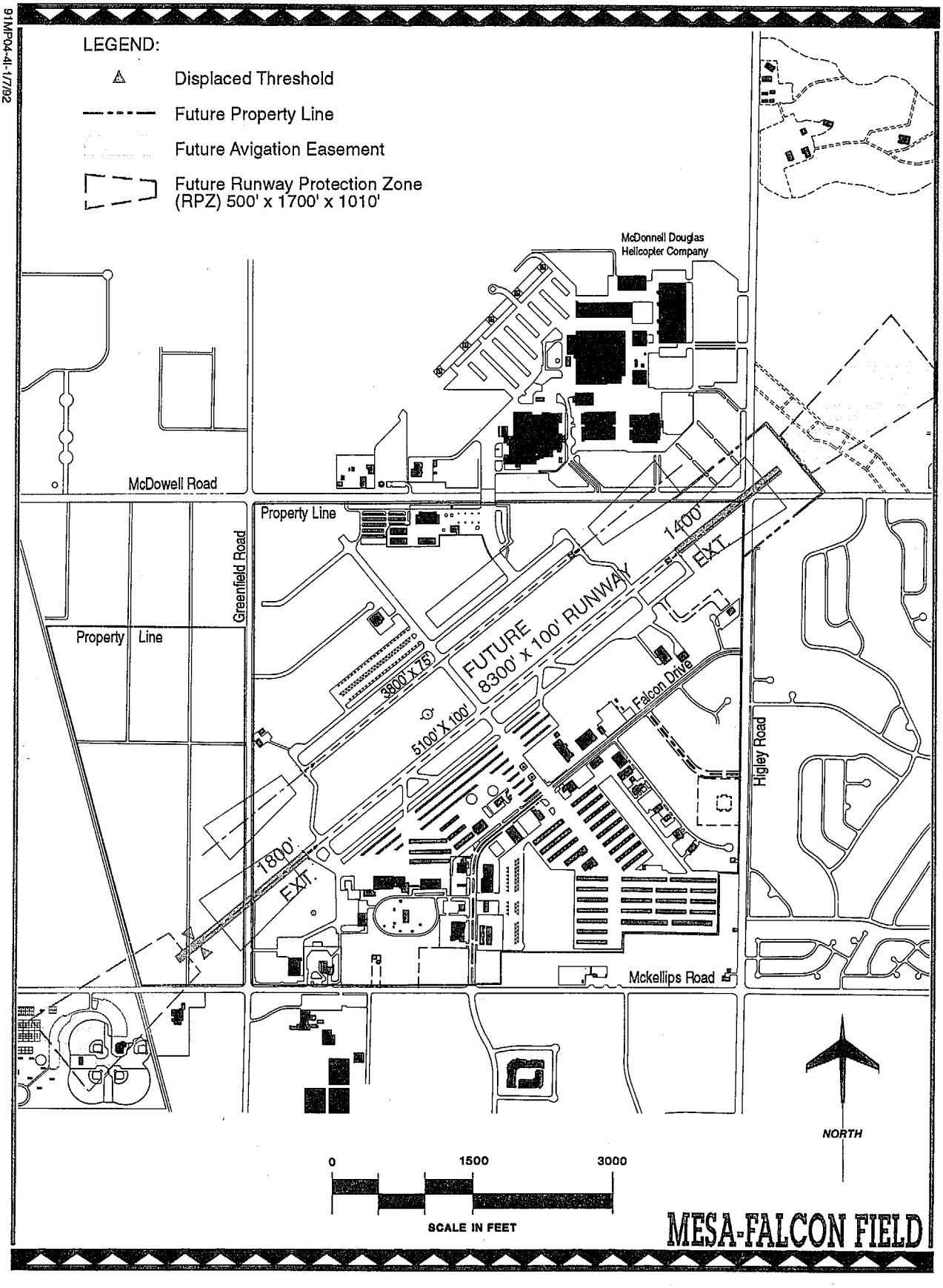

Exhibit 4I
AIRSIDE DEVELOPMENT - ALTERNATIVE 5

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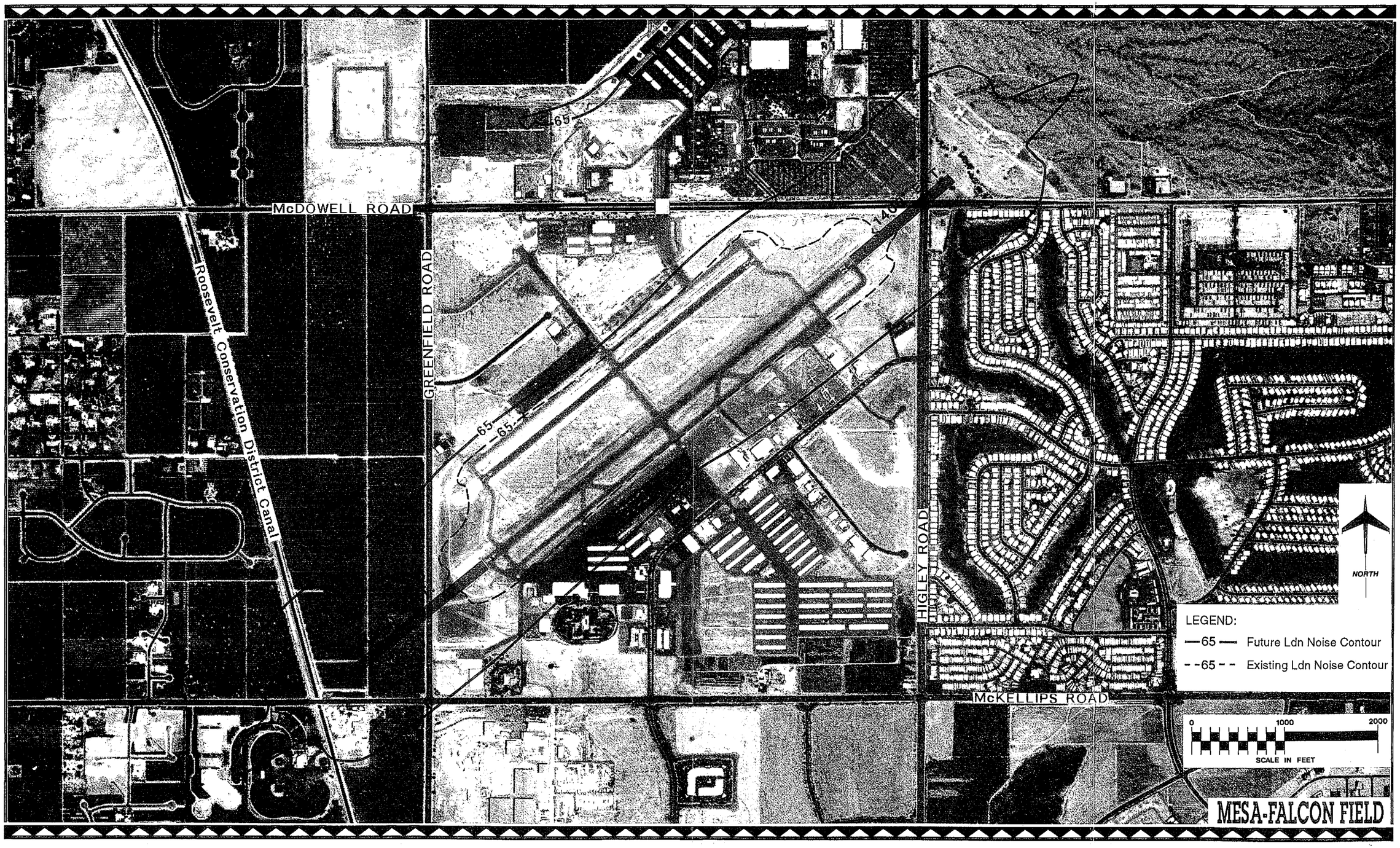

Exhibit 4J
ALTERNATIVE 5 - YEAR 2015 NOISE CONTOUR

A single scenario was used to evaluate all the jet aircraft types considered in this study. The National Business Aircraft Association (NBAA) standard temperature of 86 degrees fahrenheit was selected as the temperature condition for which the aircraft would be evaluated. **Table 4A** illustrates the takeoff runway lengths required for the selected business jet aircraft. Approximately 40 percent of the aircraft could operate on the existing runway, at that temperature and travel to a 1,500 nm destination. Sixty percent of the aircraft require a longer runway length, and even with the longer runway length, some could not achieve a range of 1,500 nm.

TABLE 4A
Required Takeoff Distance - Corporate Jet Aircraft
Mesa-Falcon Field

Aircraft	Takeoff Distance(Ft)[1]	Range[2]
Jetstar II	6,500	750
Gulfstream 1159A	5,000	1,600
Gulfstream 1159B	4,500	2,200
Gulfstream IV	4,000	2,800
Cessna 550	5,400	1,300
Learjet 35	5,250	1,350
Learjet 55	6,000	1,150
Sabre 60	6,500	700
Sabre 65	5,500	1,350
Westwind	5,300	1,300
Canadair 600	5,100	1,500
Canadair 601	4,500	2,200
Falcon 10	5,600	1,300
Falcon 100	5,600	1,300
Falcon 20	6,000	850
Falcon 900	3,500	3,500
Falcon 50	3,950	3,000

Source: A.L. Conklin Associates Aircraft Comparator, FAR 25 Balanced Field Length for listed aircraft.

NOTES: [1] Takeoff Runway length calculation based on aircraft operating with 4 passengers, at 86 degrees F, airport elevation of 1,392 feet, a range of 1,500 nm and NBAA fuel reserves.

[2] Maximum range of the aircraft (under the same conditions as Note 1) with a runway length of 5,100 feet.

Temperature Variations

As increases in temperature affect the engine performance of turbojet and turbofan engines, a study was made of the annual temperature conditions in the Phoenix area. Using 1990 temperature data obtained from the National Weather Service at Phoenix Sky Harbor Airport (**Table 4B**), a calculation was made of the percentage of time when temperatures exceeded 86 and 106 degrees fahrenheit. The temperature of 86 degrees fahrenheit is used as a standard temperature to calculate aircraft performance by the National Business Aircraft Association (NBAA). The 106 degree temperature is the mean maximum high temperature (required by FAA to calculate runway length requirements) at Falcon Field.

It appears that temperatures at or above 86 degrees occur about 33 percent of the time at the airport and temperatures in excess of 106 degrees, only three (3) percent of the time. Temperatures at or above 106 degrees normally occur in late afternoon (2:00 - 3:00 pm) and do not normally occur after 7:00 pm.

TABLE 4B
Phoenix Sky Harbor International Airport - Temperature Analysis - 1990
Mesa-Falcon Field

MONTH	TOTAL HOURS	HOURS AT OR ABOVE 86°F	HOURS AT OR ABOVE 106°F	PERCENT HOURS AT OR ABOVE 86°F	PERCENT HOURS AT OR ABOVE 106°F
January	744	0	0	0.00%	0.00%
February	672	0	0	0.00%	0.00%
March	744	54	0	7.26%	0.00%
April	720	118	0	16.39%	0.00%
May	744	288	0	38.71%	0.00%
June	720	548	121	76.11%	16.81%
July	744	629	64	84.54%	8.60%
August[1]	744	542	23	72.85%	3.09%
September[1]	720	397	22	55.14%	3.06%
October	744	189	0	25.40%	0.00%
November	720	14	0	1.94%	0.00%
December	744	0	0	0.00%	0.00%
TOTALS	**8,760**	**2,779**	**230**	**31.53%**	**2.63%**
ANNUAL PERCENTAGES				**31.72%**	**2.63%**

NOTES: [1] August and September were unusual months in 1990. An average August has approximately 615 hours at or above 86 degree temperatures and September has 415. Temperatures above 106 normally average 58 hours in August. If you adjust the figures in 1990 to reflect these *normals*, the annual percentage of temperatures above 86 degrees (adjusted) would be 32.79% and temperatures above 106 degrees (adjusted) would be 3.03%.

Temperature Effects On Runway Length

Another study was conducted to determine the effect of temperature on runway length requirements for typical jet aircraft that could be anticipated to use Falcon Field. In Table 4C, the runway lengths required under various temperature conditions are examined for three aircraft. The Falcon 50 and the Citation II could operate from the existing runway at Falcon Field nearly 70 percent of the time while the Sabreliner would have to reduce its fuel load and/or passengers (lower the aircraft gross weight) in order to use the existing runway.

It must be pointed out that the scenario used to examine the affects of temperature on runway length requirements is not necessarily the aircraft configuration the pilots would plan under those circumstances. Destination, passenger/cargo requirements, runway length and time of day would all factor into the decision to takeoff. Adjustments in any or all of these factors would produce an aircraft configuration that could operate off the available runway length. What Table 4C does indicate is that the options available to the Sabre 65 are more limited than those of the Citation II or Falcon 50.

TABLE 4C
Analysis of Temperature Affects on Corporate Jet Aircraft
Mesa-Falcon Field

Temperature (deg. F)	Required Runway Length for Takeoff (Feet)[1,2,3]			
	Sabre 65	Falcon 50	Citation II	Jetstar[4]
71	5,150	3,900	4,460	5,350
81	5,600	4,050	5,005	5,985
86	5,750	4,200	5,276	6,300
91	6,200	4,350	5,746	6,620
101	6,750	4,600	6,694	7,180
106	7,250	4,900	7,243	7,500

Source: Sabre 65 - FAA approved Airplane Flight Manual, *Sabreliner SR-77-006, Model NA 265-65, 1987*
Falcon 50 - *Falcon 50 Performance Manual, DRM-912, Jun 1990*
Citation II - *Cessna Aircraft Company Planning Guide (Citation II)*
Jetstar - Lockheed Jetstar Division, Planning Division

NOTES: (1) Takeoff length is more critical to an aircraft's performance than landing length under high temperature (density Altitude) conditions.
(2) All aircraft compared with 4 passengers and baggage, 1,500 nautical mile destination, NBAA fuel reserves, and 10 degrees of flaps.
(3) Flap setting at zero degrees.
(4) Jetstar 1329-25 model with TFE-3 engines.

Summary

The attempt to find a runway length that can accommodate all the business jet aircraft expected to operate at the airport is a complex issue as illustrated in Tables 4A, 4B and 4C. An increase in runway length will produce an incremental increase in the types of aircraft that can utilize the airfield at Falcon Field during periods of high temperatures. But other factors (number of passengers/payload, time of day, destination, etc.,) can play an equally important role in determining whether or not a jet aircraft may wish to operate into or out of Falcon Field. It is true that as temperatures increase, runway length requirements increase. It is equally true that alterations in gross weight at takeoff and time of day can offset or negate the requirement for a longer runway. The only factor that is certain is that operational safety will improve for pilots operating at Falcon Field with additional runway length.

DEVELOPMENT COSTS

Table 4D compares order of magnitude development costs for the five runway configurations. The costs reflect general cost estimates for site preparation and development of the runway-taxiway system. The City of Mesa conducted preliminary analyses to determine the potential costs for road realignment/restructuring that were used in this analyses. These costs, as well as the alternative development costs, are to be

viewed as comparison costs and not the development cost that might be expected after extensive engineering analysis and design.

Alternative I, the existing airport without changes to the airfield landing surfaces, has the lowest cost in these areas while Alternative V is the highest. The two alternatives that provide the most improvement in airport capability at the least cost are Alternatives 2 and 3. The single most important factor in determining cost is the direction of the runway extension. The McDowell-Higley Road realignment, is more than ten times as expensive to construct as the McKellips-Greenfield Road intersection. Alternative 5, which requires the restructuring of both intersections, is the highest in cost because of this factor.

TABLE 4D
Development Cost Comparisons
Mesa-Falcon Field Airport

	ALTERNATIVES				
CONSTRUCTION ITEM	1	2	3	4	5
Clearing and grubbing	$0	$50,000	$130,600	$155,600	$208,332
Runway & Twy 4R Extension	0	187,500	790,275	187,500	790,275
Runway & Twy 22L Extension	0	263,888	263,888	1,201,378	618,054
Service Road Construction	0	0	13,600	19,200	24,400
Security Fencing	0	0	40,800	57,600	73,200
Relocate PAPI/VASI Equipment	0	2,000	12,000	10,000	20,000
MIRL, Runway 4R	0	21,000	108,000	21,000	108,000
MIRL, Runway 22L	0	33,000	33,000	168,000	84,000
Taxiway Lighting	0	70,500	154,500	222,000	222,000
Runway Marking	0	2,400	6,200	6,200	10,000
Acquire Property - Construction(1)	0	0	0	1,733,000	929,700
Acquire Property - RPZ(2)	379,500	800,000	2,835,000	866,625	3,116,625
Subtotal	379,500	1,430,288	4,387,863	4,648,103	6,204,586
Engineering and Contingencies	94,875	357,572	1,096,966	1,162,026	1,551,146
Estimated Development Cost	$474,375	$1,787,850	$5,484,828	$5,810,128	$7,755,732
Arterial Realignment Cost	0	0	2,750,000	15,000,000	17,750,000
Comparative Cost(3)	**$474,400**	**$1,787,900**	**$8,234,800**	**$20,810,100**	**$25,505,700**

NOTE: (1) Some of the property required for construction is owned by the City of Mesa, however, there are private options on this property that might require purchase.
(2) An alternative would be to pay an annual avigation easement cost.
(3) Comparative Development Cost rounded to nearest $100.

SUMMARY

In summary, the lowest cost development configuration is Alternative 1 which does not provide any additional capability to the airport. Alternative 2, improves the capability of the airport to accommodate nearly 96 percent of the business jet aircraft expected to operate at Falcon Field. For a modest increase in cost, a very significant increase in airport capability can be obtained.

Alternative 2 does not interfere with the existing road alignments while Alternatives 3, 4 and 5 produce substantial changes to the existing road structure. Also with Alternative 2 noise impacts are distributed more equally northeast and southwest of the airport. It is for these reasons that **Alternative 2** is the **recommended** airside development program for the airport.

LANDSIDE DEVELOPMENT ALTERNATIVES

Once the airside alternative has been selected, attention must be turned to the airport's potential to meet the general aviation demand for facilities throughout the planning period. In response to the facilities identified as requirements in the previous Chapter, three alternatives were developed for Falcon Field. Each of these alternatives were evaluated on their ability to accommodate the following facilities:

- Terminal Building expansion
- Future commercial/corporate parcels
- Additional T-Hangars
- Falcon Drive-Taxiway B alternative
- Additional apron
- Airplane Design Group (ADG) II and III aircraft separation criteria
- Commercial/Industrial development parcels

LANDSIDE ALTERNATIVE A

With **Alternative A**, as illustrated on **Exhibit 4K**, the primary focus is obtaining the maximum development of all the required T-Hangar facilities in the existing area south of Falcon Drive, without acquiring any additional property. T-Hangars, in this alternative, are constructed west of the existing T-Hangars on undeveloped land and on an existing tiedown apron. Several T-Hangars are extended to accommodate an additional 6 hangars each. If non-aircraft storage needs are ignored, this particular alternative will accommodate all the T-hangar facilities required during the planning period.

A taxilane has been constructed from Taxiway B-10 across Roadrunner Drive. to provide taxiway access for corporate parcel development in this area. Property further to the east is designated for commercial and industrial development. Roadrunner Drive will be terminated prior to the new taxilane and access to the southern businesses on this street will be provided from Higley Road. Additional corporate parcels are located in the area between the water tower and the hotel site, adjacent to McKellips Road. Taxiway access is also provided to these parcels as well. Corporate parcel development can also take place north of parallel Runway 4L-22R, as indicated on **Exhibit 4K**.

With Alternative A, an underpass would be constructed at Taxiway B-5/7 on Falcon Drive to reduce potential vehicle/aircraft conflicts and provide safe separation from aircraft and vehicles. Terminal Building expansion is planned to the west of the existing facility. By modifying the existing facility, reallocating space and building an addition to the west side of the existing terminal building, future facility requirements can be accommodated.

Additional apron for ADG II and III aircraft can be constructed northeast of the terminal building, as indicated on **Exhibit 4K**. The relocation of two nested T-hangar units (Hangars O-1 to O-7 and C-1 to C-10) will provide the necessary separation for ADG II aircraft to taxi into the hangar and corporate parcel areas. ADG I aircraft will be able to have dual taxilanes on B-7, 8 and 9.

LANDSIDE ALTERNATIVE B

With **Alternative B**, as illustrated on **Exhibit 4L**, the primary focus is obtaining the maximum development of all the required T-Hangar facilities in the existing area by acquiring 34 acres of nursery property south of Falcon Drive. T-Hangars, with this alternative, would be constructed west of the existing T-Hangars on undeveloped land and an existing tiedown apron, similar to Alternative A. In addition, T-Hangars are constructed on the acquired area south of the existing hangars. An on-airport service road is constructed parallel to McKellips Road that will provide access to hangars south and east of Falcon Drive. Automobile parking facilities are planned south and east of the hangar area, adjacent to Higley Road.

This particular alternative will accommodate all the T-hangar facilities required during the planning period, including non-aircraft storage needs. There is also additional area to provide for any unexpected demand or post-planning period needs.

A taxilane has been constructed from Taxiway A-5 to the east to provide taxiway access for corporate parcels located in this area. Property further to the east is designated for commercial/industrial development. Additional corporate parcel development can also take place north of parallel Runway 4L-22R, as indicated on **Exhibit 4L**.

In Alternative B, Falcon Drive is terminated to the east and west of Taxiway B-5/7 to prevent possible conflicts between aircraft and vehicles. Alternative access will be provided from Higley and McKellips Roads. Terminal Building expansion is planned to the east to accommodate the future space requirements. By modifying the existing facility, reallocating space and building an addition to the east side of the existing terminal building, the long term needs of the terminal can be met.

Additional apron for ADG II and III aircraft is planned for construction northeast of the terminal building, similar to Alternative A. The relocation of two T-Hangar units (Hangars O-1 to O-7 and C-1 to C-10) will provide the necessary separation for ADG II aircraft to taxi into the hangar and corporate parcel areas. ADG I aircraft will be able to have dual taxilanes on B-7, 8, 9 and possibly 10 (pending revision of existing lease agreements).

LANDSIDE ALTERNATIVE C

In **Alternative C**, as illustrated on **Exhibit 4M**, the primary focus is in obtaining the maximum development of all the required T-Hangar facilities in the existing area south of Falcon Drive and north of the parallel runway, without acquiring any additional property. T-Hangars, in this alternative, are constructed west of the existing T-Hangars on undeveloped land and on an existing tiedown apron, similar to Alternatives A and B. In addition, T-Hangars are constructed north of the parallel runway as indicated on **Exhibit 4M**. Automobile parking facilities are planned north of the hangar area adjacent to Mallory Drive. An FBO is planned in this area to meet the aviation demand that will be generated. This particular alternative will accommodate all the T-hangar facilities required during the planning period, including non-aircraft storage needs. There is also additional expansion area to provide for any unexpected demand or post-planning period needs.

A taxilane has been constructed, similar to Alternatives A and B, from Taxiway A-5 to

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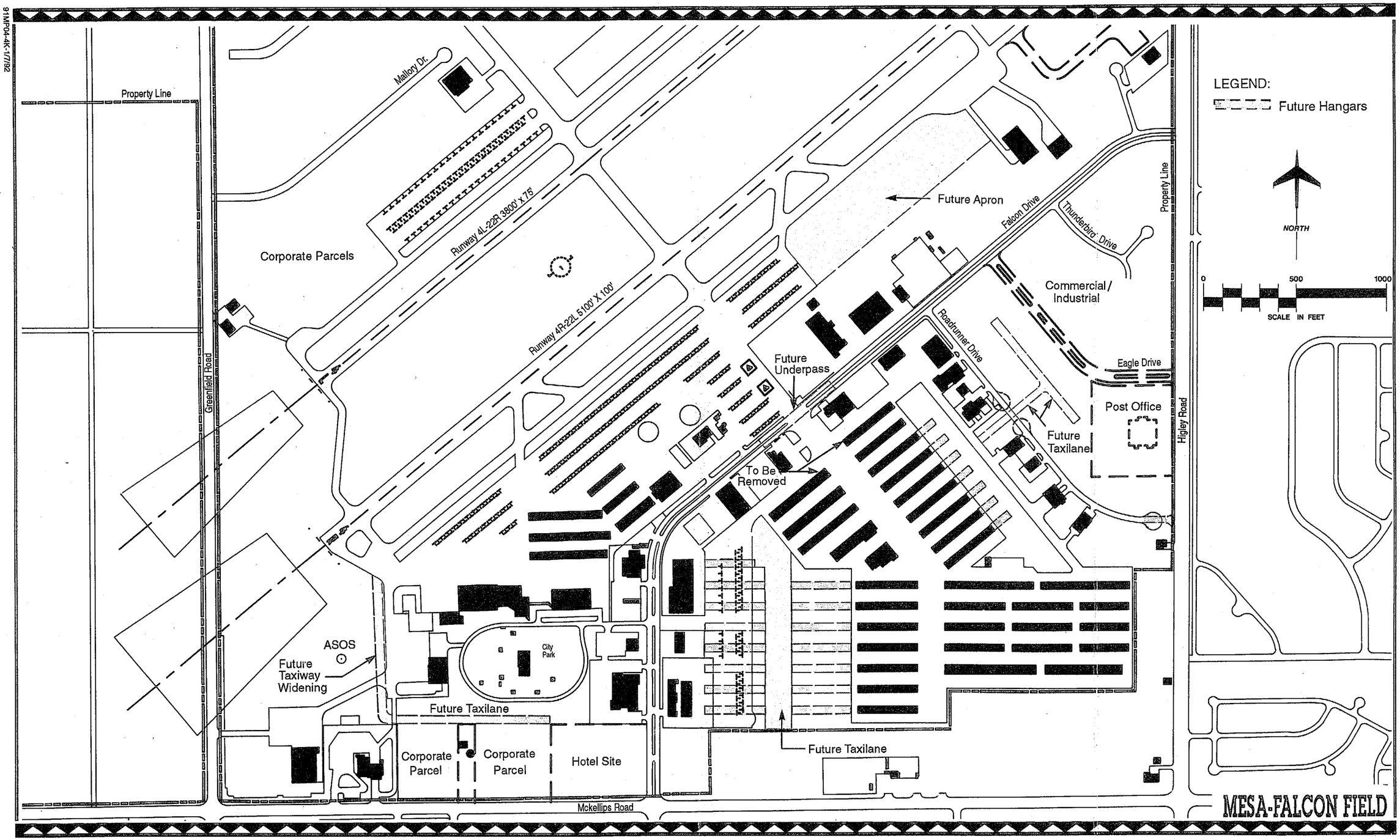

Exhibit 4K
LANDSIDE DEVELOPMENT - ALTERNATIVE A

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Property Line

Corporate Parcels

Mallory Dr.

Corporate Parcels

Runway 4L-22R 3800' x 75'

Runway 4R-22L 5100' X 100'

Greenfield Road

Future Apron

Falcon Drive

Thunderbird Drive

Property Line

Commercial / Industrial

Roadrunner Drive

Commercial / Industrial

Eagle Drive

Post Office

Higley Road

LEGEND:

Future Hangars

NORTH

0 500 1000

SCALE IN FEET

To Be Removed

ASOS

Future Taxiway Widening

City Park

Future Taxilane

Corporate Parcel

Corporate Parcel

Hotel Site

Access Road

Future Taxilane

FBO

Auto Parking

Auto Parking

Access Road

Future Property Line

Mckellips Road

MESA-FALCON FIELD

Exhibit 4L
LANDSIDE DEVELOPMENT - ALTERNATIVE B

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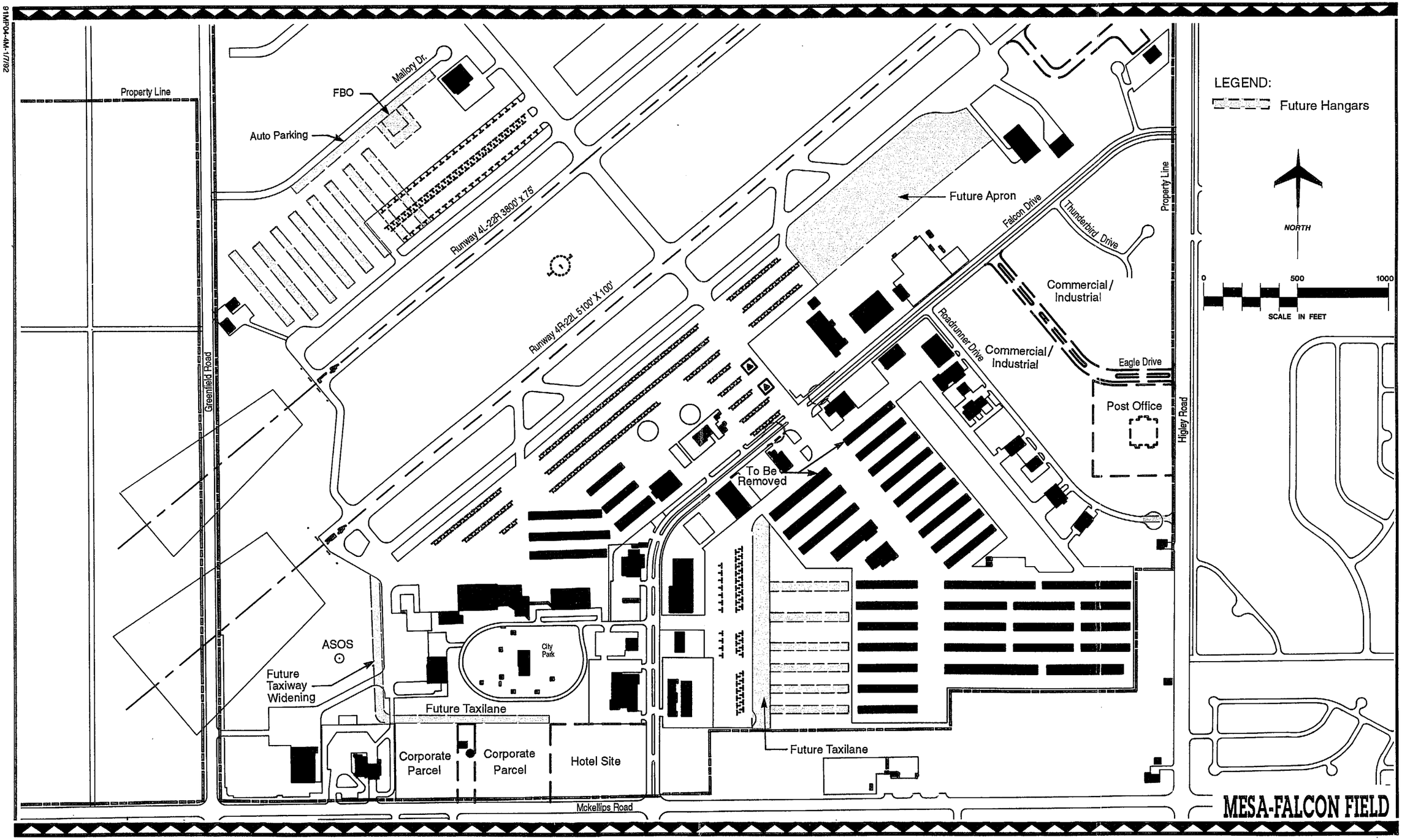

Exhibit 4M
LANDSIDE DEVELOPMENT - ALTERNATIVE C

the east to provide taxiway access for corporate parcels located in this area. Property further to the east is designated for commercial/industrial development. Additional corporate parcel development can also take place north of Mallory Drive.

In Alternative C, Falcon Drive is terminated to the east and west of Taxiway B-5/7 to prevent possible conflicts between aircraft and vehicles. Alternative access will be provided from Higley and McKellips Roads. Terminal Building expansion is planned to the north to accommodate the future space requirements. By modifying the existing facility, reallocating space and building an addition to the north side of the existing facility, the long term needs of the terminal can be met.

Additional apron for ADG II and III aircraft is planned for construction northeast of the terminal building, similar to Alternatives A and B. The relocation of two T-Hangar units (Hangars O-1 to O-7 and C-1 to C-10) will provide the necessary separation for ADG II aircraft to taxi into the hangar and corporate parcel areas. ADG I aircraft will be able to have dual taxilanes on B-7, 8, 9 and possibly 10 (pending revision of a lease agreement).

DEVELOPMENT COSTS

Table 4E compares order of magnitude development costs for the three landside alternatives. These costs are to be viewed as comparison costs and not the development cost that might be expected after extensive engineering analysis and design.

TABLE 4E
Landside Development Cost Comparisons
Mesa-Falcon Field Airport

Descriptor[1]	ALTERNATIVE A	B	C
Taxiway/taxilane construction	$342,500	$230,000	$230,000
Apron construction	1,032,500	1,032,500	1,032,500
Access road construction	0	200,000	0
Property acquisition	0	1,682,500	0
Auto parking facilities	0	177,600	86,400
Falcon Drive alternative	1,200,000[2]	75,000	75,000
Terminal expansion	137,500	137,500	137,500
Total	**2,712,500**	**3,535,100**	**1,561,400**

NOTE: (1) Hangar construction costs will vary slightly depending upon type and number, however, these costs would be similar and incurred in all alternatives.

(2) This estimate is based on a 4-lane divided roadway, with sidewalks, in the underpass. Further engineering analysis would be required to determine an actual cost.

SUMMARY

All of these landside alternatives can be accommodated with any of the airside alternatives with only minor modifications. Alternatives A and C are the least costly to develop, however, these alternatives provide the least flexibility in hangar development. Alternative B provides the best solution to the Falcon Drive termination at Taxiway B5/7 because an alternative route to the east side of the airport is provided from McKellips by the access road off Falcon Drive, south of the T-Hangar facilities. However, the cost of this alternative is the highest of all, including Alternative A, which includes a Falcon Drive underpass. Cost versus inconvenience will play an important role in the selection of an underpass or termination for Falcon Drive.

CONCLUSIONS

This chapter has examined concepts for airport development at Mesa-Falcon Field Airport with regard to physical, operational and environmental factors associated with each category. The analysis has centered primarily on airfield development and its influence on the future direction of general aviation activity.

Following review and input from the Planning and Advisory Committee (PAC), a final development plan for the airport was selected. **Airside Development-Alternative 2**, construction of Runway 4R-22L to a 6,000 foot runway length by extending both runway ends, was selected as the most efficient use of airport property with the least environmental impact on the community. This airside development will increase the ability of aircraft to operate into and out of the airport during high density altitude situations, increasing the safety of airport operations during high temperature conditions.

Landside Development-Alternative B, with some modifications, as depicted in **Exhibit 4N**, was determined to be the most economical and functional use of the facilities from both a short and long range perspective. The Falcon Drive Overpass was recommended by the PAC as the best solution to the road-taxiway intersection on Falcon Drive. This position was supported by the City of Mesa Traffic Engineer as well. The alternative, cul-de-sacing both sides of Falcon Drive at the B-7 taxiway would have negative impacts on the businesses established in the area. A cul-de-sac would also create a 2,200 foot long cul-de-sac, far in excess of the 400 foot maximum for this type of construction required by the City.

Improvements to Alternative B included widening Taxilane B-10, widening Taxiways B-3, B-4, B-5 and B-6 to accommodate dual taxilanes and the location of a Helicopter Takeoff and Landing area on the north side of Runway 4L-22R. The construction of these projects will improve access from the runways to the airport terminal areas and decrease delays to aircraft attempting to land or takeoff. The next step will involve an environmental evaluation of the final development concept followed by a financial management plan with recommendations to ensure proper implementation and timing of the program.

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Property Line

Corporate Parcels

Mallory Dr.

Helicopter FATO

Runway 4L-22R 3800' x 75'

Corporate Parcels

Runway 4R-22L 5100' X 100'

Greenfield Road

Future Apron

Falcon Drive

Thunderbird Drive

Property Line

Commercial / Industrial

Future Underpass

Roadrunner Drive

Commercial / Industrial

Eagle Drive

Post Office

Higley Road

To Be Removed

ASOS

Future Taxiway Widening

City Park

Future Taxilane

Corporate Parcel

Corporate Parcel

Hotel Site

Access Road

Future Taxilane

FBO

Auto Parking

Auto Parking

Access Road

Future Property Line

Mckellips Road

MESA-FALCON FIELD

LEGEND:

Future Hangars

NORTH

0 500 1000

SCALE IN FEET

Exhibit 4N
RECOMMENDED LANDSIDE DEVELOPMENT